

## 2012 MCAS Exam Test Items

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Test item alignment to  
Energy 1: Integrating Sciences through Energy  
Questions 2, 6, 7, 8, 15 & 17 directly align.

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## XVII. Science and Technology/Engineering, Grade 8

## Grade 8 Science and Technology/Engineering Test

The spring 2012 grade 8 Science and Technology/Engineering test was based on learning standards in the four major content strands in the Massachusetts *Science and Technology/Engineering Curriculum Framework* (2006) listed below. Page numbers for the grades 6–8 learning standards appear in parentheses.

- Earth and Space Science (*Framework*, pages 32–33)
- Life Science (Biology) (*Framework*, pages 51–53)
- Physical Sciences (Chemistry and Physics) (*Framework*, pages 67–68)
- Technology/Engineering (*Framework*, pages 87–89)

The *Science and Technology/Engineering Curriculum Framework* is available on the Department website at [www.doe.mass.edu/frameworks/current.html](http://www.doe.mass.edu/frameworks/current.html).

Science and Technology/Engineering test results are reported under four MCAS reporting categories, which are identical to the four framework content strands listed above.

### Test Sessions

The grade 8 Science and Technology/Engineering test included two separate test sessions. Each session included multiple-choice and open-response questions. Approximately half of the common test items are shown on the following pages as they appeared in test booklets.

### Reference Materials and Tools

The use of bilingual word-to-word dictionaries was allowed for current and former English language learner students only, during both Science and Technology/Engineering test sessions. No other reference tools or materials were allowed.

### Cross-Reference Information

The tables at the conclusion of this chapter indicate each released and unreleased common item's reporting category and the framework learning standard it assesses. The correct answers for released multiple-choice questions are also displayed in the released item table.

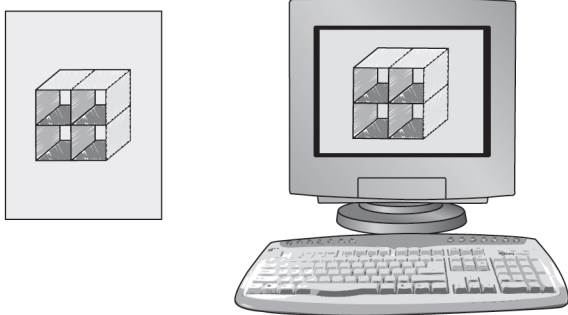
# Science and Technology/Engineering

## SESSION 1

### DIRECTIONS

This session contains eleven multiple-choice questions and one open-response question. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

- 1 The pictures below show a drawing on paper and the same drawing in an electronic format on a computer screen.

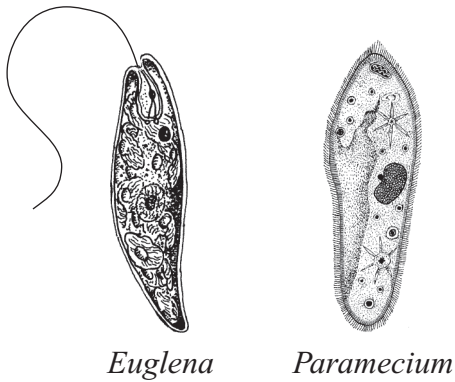


Which of the following devices was **most likely** used to convert the drawing on paper into an electronic format that could be viewed on a computer screen?

- A. Internet modem
- B. network router
- C. printer
- D. scanner

- 2 Which of the following processes usually takes the **longest** amount of time?
- A. Hot lava cools and forms new rock.
  - B. Water vapor condenses to form a cloud.
  - C. A seismic wave travels through the mantle.
  - D. An ocean basin forms between two continents.

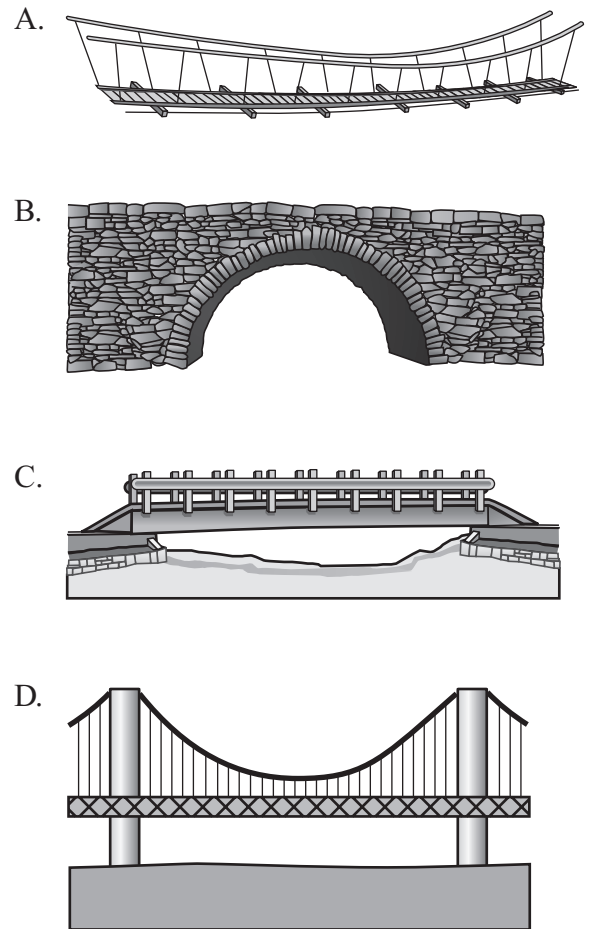
- 3 The illustration below represents two protists.



What do these two organisms have in common?

- A. They are unicellular.
- B. They cause diseases.
- C. They live underground.
- D. They are photosynthetic.

- 4 Which of the following pictures shows a beam bridge?



- 5 Oxygen and iron combine chemically to form rust. Rust is classified as which of the following?

- A. an atom
- B. a compound
- C. an element
- D. a mixture

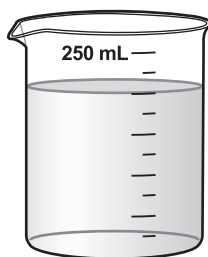
- 6 Heat energy from the Sun is transferred to Earth primarily by which of the following processes?

- A. conduction
- B. convection
- C. evaporation
- D. radiation

- 7 Scientists found evidence of past glacial activity in Massachusetts. Which of the following conclusions is **best** supported by this evidence?

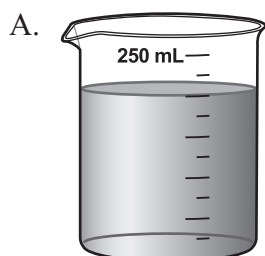
- A. Sea levels were much higher in the past.
- B. The climate on Earth has changed over time.
- C. Total numbers of organisms on Earth have changed over time.
- D. The total amount of radiation from the Sun was much higher in the past.

- 8 The picture below shows a beaker containing a clear liquid with a temperature of  $20^{\circ}\text{C}$ .

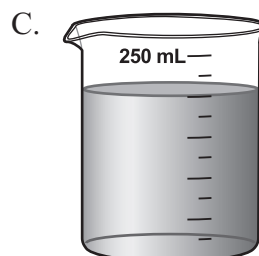


$20^{\circ}\text{C}$ , clear

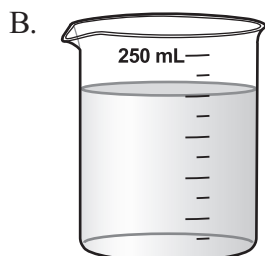
A blue powder is added to the liquid. Which of the following pictures provides the best evidence that the change to the liquid is physical, not chemical?



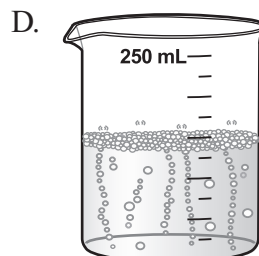
$20^{\circ}\text{C}$ , blue



$5^{\circ}\text{C}$ , blue



$35^{\circ}\text{C}$ , clear



$20^{\circ}\text{C}$ , clear

- 9 Ann makes hats for people. She has each person select the fabric and a hat style before she makes the hat to fit the person's head size.
- Which type of manufacturing system is Ann **most likely** using to make hats?
- A. mass production
  - B. custom production
  - C. automated production
  - D. assembly line production

- 10 Which of the following are formed when two crustal plates collide with one another?
- A. hot spots
  - B. rift valleys
  - C. mountain ranges
  - D. mid-ocean ridges

- 11 Leather basketballs are made for indoor use on smooth surfaces. Rubber basketballs are made for use on many different surfaces.
- Which of the following properties of rubber makes it better than leather for use on many different surfaces?
- A. Rubber is durable.
  - B. Rubber is lightweight.
  - C. Rubber is dark in color.
  - D. Rubber is quickly produced.

Question 12 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 12 in the space provided in your Student Answer Booklet.

- 12** A scientist has three unlabeled samples of pure metals. He wants to determine the identity of each metal.
- Identify which **one** of the following properties the scientist should use to determine the identity of the pure metal in each sample: color, melting point, mass, or volume.
  - Explain why the property you identified in part (a) can be used to determine the identity of the pure metal in each sample.

The scientist cuts each of the samples of pure metal into two smaller pieces.

- Is the property that is used to determine the identity of the metal affected when each sample is cut into two pieces? Explain your answer.

The scientist can also use density to determine the identity of the pure metal in each sample.

- Describe how the scientist can determine the density of the pure metal in each sample.



# Science and Technology/Engineering

## SESSION 2

### DIRECTIONS

This session contains eight multiple-choice questions and one open-response question. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

**13** Which of the following statements **best** describes how the four planets closest to the Sun are different from the next four planets in our solar system?

- A. The four closest planets are more dense.
- B. The four closest planets have more moons.
- C. The four closest planets have greater diameters.
- D. The four closest planets take longer to complete one orbit.

**14** Which of the following parts of the human body is **most** complex?

- A. heart
- B. kidney
- C. white blood cell
- D. central nervous system

- 15 Some types of bacteria can only live where oxygen is **not** present. These bacteria were well adapted to life on Earth over 2 billion years ago.

Which of the following changes caused many of these bacteria to become extinct?

- A. the slow movement of tectonic plates
- B. the varying temperatures of each season
- C. an increase in volcanic activity under the oceans
- D. an increase in the number of photosynthetic organisms

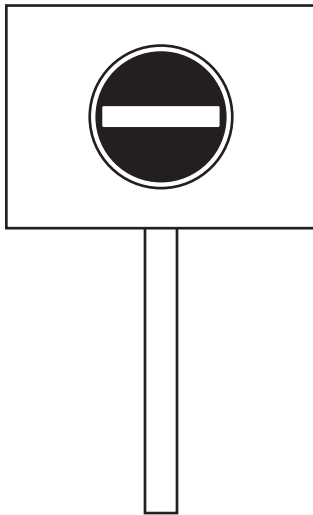
- 16 A ship has a satellite communication device to identify the ship's position at sea. For which of the following activities is this device **most likely** used?

- A. control
- B. guidance
- C. propulsion
- D. suspension

- 17 Which of the following could occur as a result of decreasing the heat energy of a gas?

- A. condensation
- B. evaporation
- C. radiation
- D. vaporization

- 18 The international highway symbol for “No Entry” is shown on the sign below.



Which of the following is the **most** important reason why this symbol is used on roads throughout Europe?

- A. Symbols take up less space on a sign than words.
- B. European countries have many different languages.
- C. Small children can understand symbols better than words.
- D. One factory can make signs used by many European countries.

- 19 Miriam notices when she goes to the beach that sometimes the water rises as high as the pier. At other times of the day, the water barely covers the pillars under the pier.

These differences in water level are **primarily** due to the gravitational influence of which of the following?

- A. the Sun
- B. the Moon
- C. asteroids
- D. comets

- 20 The winter solstice occurs on either December 21 or 22, depending on the year. Which of the following statements **best** explains why the time of the year the winter solstice occurs has the least amount of daylight in Massachusetts?

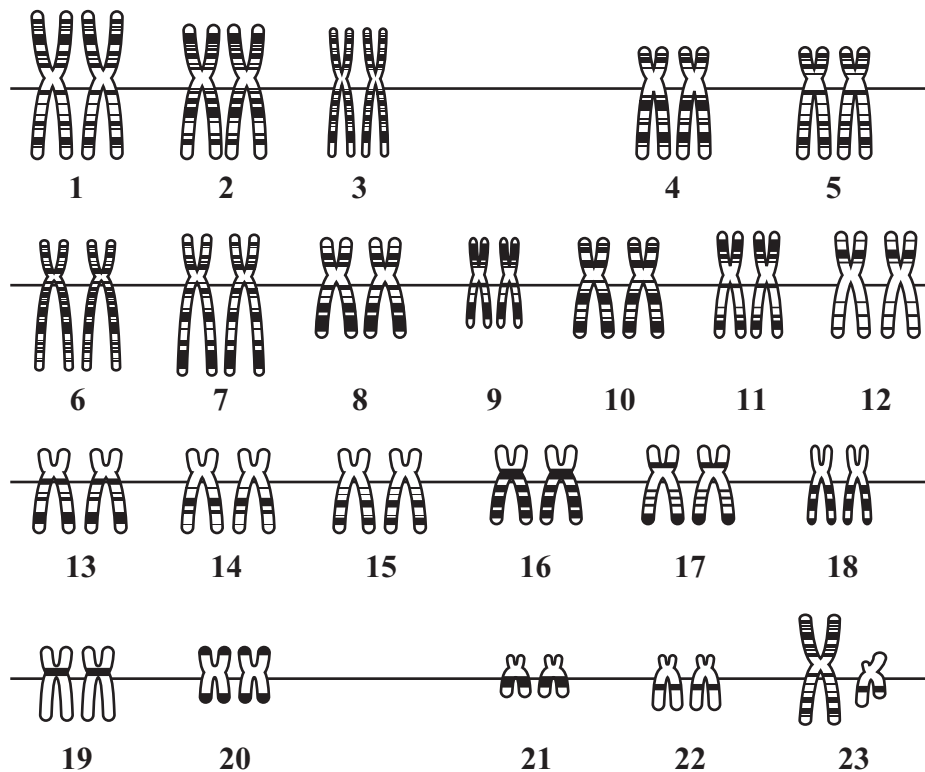
- A. Earth is farthest away from the Sun on the winter solstice.
- B. Earth’s rotational speed on its axis is greatest on the winter solstice.
- C. Earth is traveling around the Sun with the greatest speed on the winter solstice.
- D. Earth’s Northern Hemisphere is tilted away from the Sun on the winter solstice.

Question 21 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 21 in the space provided in your Student Answer Booklet.

- 21** The diagram below represents 23 pairs of structures taken from the nucleus of a human body cell.



- Identify the structures shown in the diagram.
- Identify the information that is contained within these structures.
- Describe how the structures from this cell would compare to the structures in the nucleus of another body cell from the same person.
- Explain why the structures are in pairs.

**Grade 8 Science and Technology/Engineering**  
**Spring 2012 Released Items:**  
**Reporting Categories, Standards, and Correct Answers\***

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC)*
1	286	<i>Technology/Engineering</i>	3.2	D
2	286	<i>Earth and Space Science</i>	5	D
3	287	<i>Life Science</i>	2	A
4	287	<i>Technology/Engineering</i>	5.2	C
5	288	<i>Physical Sciences</i>	5	B
6	288	<i>Earth and Space Science</i>	3	D
7	288	<i>Earth and Space Science</i>	7	B
8	289	<i>Physical Sciences</i>	10	A
9	290	<i>Technology/Engineering</i>	4.1	B
10	290	<i>Earth and Space Science</i>	6	C
11	290	<i>Technology/Engineering</i>	2.4	A
12	291	<i>Physical Sciences</i>	9	
13	292	<i>Earth and Space Science</i>	10	A
14	292	<i>Life Science</i>	5	D
15	293	<i>Life Science</i>	12	D
16	293	<i>Technology/Engineering</i>	6.3	B
17	293	<i>Physical Sciences</i>	15	A
18	294	<i>Technology/Engineering</i>	3.4	B
19	294	<i>Earth and Space Science</i>	9	B
20	294	<i>Earth and Space Science</i>	11	D
21	295	<i>Life Science</i>	8	

\* Answers are provided here for multiple-choice items only. Sample responses and scoring guidelines for open-response items, which are indicated by shaded cells, will be posted to the Department's website later this year.

**Grade 8 Science and Technology/Engineering  
Spring 2012 Unreleased Common Items:  
Reporting Categories and Standards**

<b>Item No.</b>	<b>Reporting Category</b>	<b>Standard</b>
22	<i>Physical Sciences</i>	3
23	<i>Life Science</i>	11
24	<i>Technology/Engineering</i>	2.3
25	<i>Life Science</i>	16
26	<i>Life Science</i>	13
27	<i>Physical Sciences</i>	8
28	<i>Earth and Space Science</i>	1
29	<i>Physical Sciences</i>	6
30	<i>Life Science</i>	1
31	<i>Physical Sciences</i>	13
32	<i>Technology/Engineering</i>	2.5
33	<i>Life Science</i>	15
34	<i>Technology/Engineering</i>	2.6
35	<i>Physical Sciences</i>	2
36	<i>Earth and Space Science</i>	4
37	<i>Technology/Engineering</i>	1.3
38	<i>Physical Sciences</i>	4
39	<i>Earth and Space Science</i>	2
40	<i>Life Science</i>	18
41	<i>Physical Sciences</i>	14
42	<i>Technology/Engineering</i>	6.4